

## 34 Faraday's Researches

of the cold metals having frozen the water where they touched it, and thus insulating the fluid part; and it well illustrates the non-conducting power of ice, by showing how thin a film could prevent the transmission of the battery current. Upon thawing parts of this thin film, at *both* metals, conduction occurred.

124. Upon warming the tin case and removing the piece of ice, it was^ found that a cork having slipped, one of the edges of the platina had been all but in contact with the inner surface of the tin vessel; yet, notwithstanding the extreme thinness of the interfering ice in this place, no sensible portion of electricity had passed.

125. These experiments were repeated many times with the same results. At last a battery of fifteen troughs, or one hundred and fifty pairs of four-inch plates, powerfully charged, was used; yet even here no sensible quantity of electricity passed the thin barrier of ice.

126. It seemed at first as if occasional departures from these effects occurred; but they could always be traced to some interfering circumstances. The water

should in every instance be well frozen; for though it is not necessary that the ice should reach from pole to pole, since a barrier of it about one pole would be quite sufficient to prevent conduction, yet, if part remain fluid, the mere necessary exposure of the apparatus to the air, or the approximation of the hands, is sufficient to produce, at the *upper surface* of the water and ice, a film of fluid, extending from the platina to the tin; and then conduction occurs.

Again, if the corks used to block the platina in its place are damp or wet within, it is necessary that the cold be sufficiently well applied to freeze the water in them, or else when the surfaces of their contact with the tin become slightly warm by handling, that part will conduct, and the interior being ready to conduct also, the current will pass.

The water should be pure, not only that unembarrassed results may be obtained, but also that, as the freezing proceeds, a minute portion of concentrated saline solution may not be formed, which remaining fluid, and being interposed in the ice, or passing into cracks resulting from contraction, may exhibit conducting powers independent

of the ice itself.

127, On one occasion I was surprised to find that after thawing much of the ice the conducting power had not been restored; but I found that a cork which held the wire just where it joined the platina, dipped so far into the ice, that with the ice itself